

You may think that a small, individual garden will not make a difference, but collectively they can make a great impact. This is a guide for your Rain Garden design, not a set of strict rules. Each site is different and the concepts can be applied many different ways. You do not have to be an engineer to build a rain garden. The garden can be as complex or as simple as you are able to provide, depending on time, space and budget. The rain garden does not require much space and can fit into existing landscapes or made into any shape.

How do I Begin?

We will design a Rain Garden that will capture the first flush of runoff from your impervious surfaces and will attempt to mimic the functions of a forest. Forests provide many benefits that reduce the negative effects of storm water runoff. These include interrupting and redirecting the flow of storm water, allowing for the percolation into the soil, and filtering pollutants from the water as it passes through the organic forest soils. Trees also remove nutrients and use them for growth, which in turn reduces erosion by leaf interception of water droplets and the root masses hold soil in place. Figure 2 illustrates the interaction between trees and rainfall.

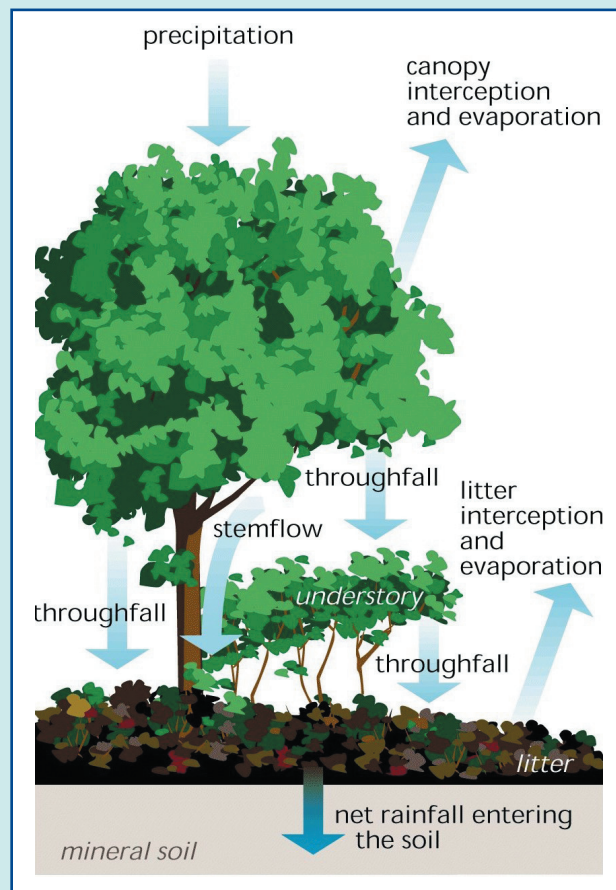


Figure 2. Illustration of forest function

http://www.nrcs.usda.gov/technical/stream_restoration/scriimage.htm

So, are we actually creating a forest by using the Rain Garden concept? No, but we are putting a system into the landscape that can provide functions that are missing because forests have been lost to urbanization.

In order for us to begin to learn how a Rain Garden works, we must first know the layers of the rain garden (refer to Figure 3). These layers include:

- ◆ A **grass buffer strip** around the garden that will slow the velocity of the runoff;
- ◆ A **mulch layer** will provide a medium for the biological activities to occur and will keep the soil moist;
- ◆ **Native plants** that will use the runoff for moisture and nutrient requirements;
- ◆ A **soil layer** is where the native plant roots will collect the moisture and nutrients for their growth;
- ◆ A **ponding area or depression** of the garden will provide the storage needed for the runoff, and
- ◆ A **berm** that is at least six inches of soil or rocks that works like a dam to pond the runoff.

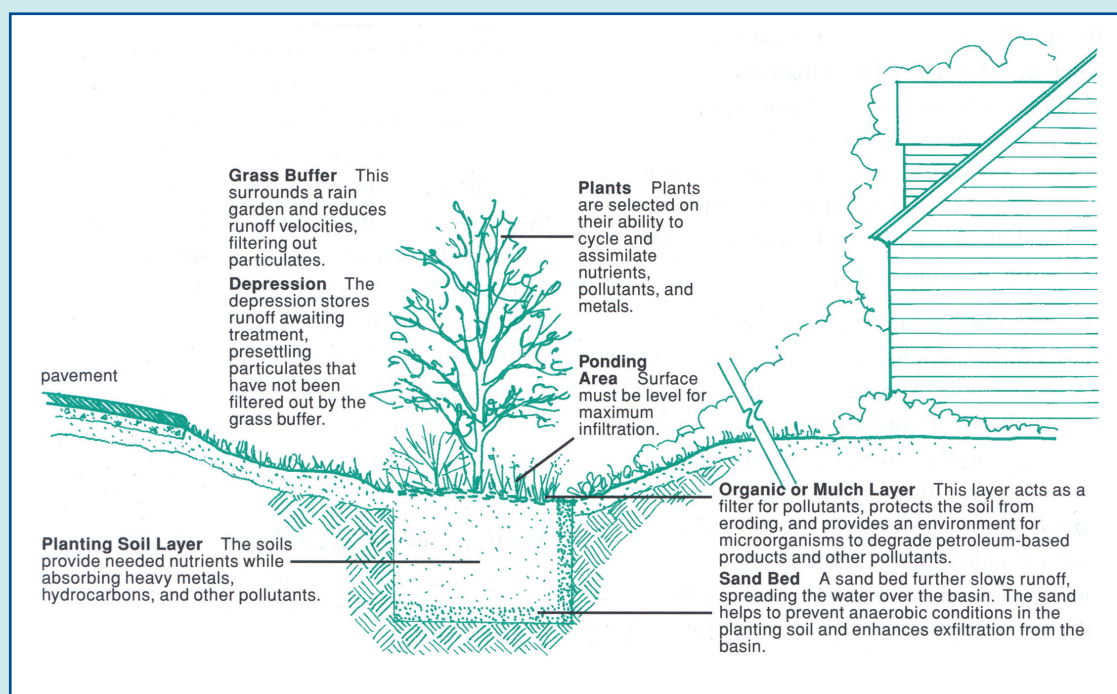


Figure 3: Cross section of a Rain Garden

<http://fairfaxcounty.gov/nvswcd/youyourland/landscape.pdf>

How does my Rain Garden Work?

Now that you know the layers of a Rain Garden, let's go into more detail on how this storm water management tool works. The Rain Garden is placed in a location to collect the runoff as a rain event occurs. The layers filter the runoff naturally as the runoff moves into and throughout the Rain Garden. The native plants and microorganisms found in the soil will remove the pollutants that are carried in the runoff from the roof and driveway. By preventing the runoff from going into a typical curb and gutter storm water system, you will help eliminate the pollutants from going directly into streams and lakes and, eventually, into the Chesapeake Bay.

Where should I locate my Rain Garden?

There are several places that you may wish to consider when looking for a location for your Rain Garden. You may decide to place it near the house to catch the roof runoff, or you may place it farther from your house and collect the runoff from your lawn and possibly your driveway. You can decide where the best location will be. Sketch a drawing of your property similar to Figure 4.

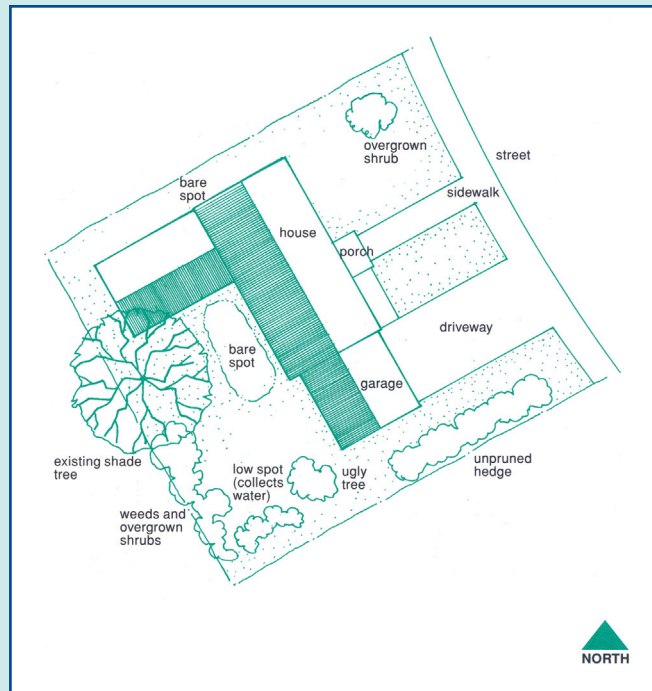


Figure 4. Site Inventory

<http://fairfaxcounty.gov/nvswcd/youyourland/landscape.pdf>

Placing your rain garden may be easy if there is a low spot in the landscape, but it is also possible in a relatively flat lot. Take a walk around the property and make note of high and low areas and areas where water naturally flows. Note areas around gutters, pavement, and outbuildings.

Here are some ideas to consider when planning the location of your Rain Garden:

- ◆ Do not remove or damage existing trees to construct the Rain Garden. If you would like to plant in the vicinity of an existing tree, please make sure you do not disturb the soil or roots. Make sure the garden is located outside the drip line of the tree.
- ◆ You may feel that a location where water already ponds in your yard may be appropriate, but it is NOT. This is a location where the soil does not allow adequate infiltration and is not a good place for the Rain Garden. You will want a section of soil that has adequate infiltration, the procedure to test for this can be found on page 9.
- ◆ Know where your utility lines, such as electric, sewer, water, and gas, are located before you decide the garden location. Call Miss Utility. You would not want to place a great deal of effort into a garden that will be dug up by a utility company.
- ◆ Pick out a location that is at least 10 feet from your home. You do not want a flooded basement or leaky foundation.
- ◆ Choose a site that does not have a steep slope. Slopes that are greater than 12% will take much more effort to design and may not be as effective.
- ◆ Know where your water table is located. You do not want the Rain Garden to directly interact with your water table.
- ◆ Take into consideration the views from inside and outside your home. Why not place the garden near a large window or near your patio so that you and your family can enjoy the beauty of the garden all year long?

Survey the Land

Once you have determined the location of your Rain Garden, the following steps will help you get the lay of the land (elevations). Once you know the elevation differences of the Rain Garden area, you will know the extent of soil removal or replacement needed to make the garden ponding area level.

There are certain tools you will need to determine the slope of the land. It is really a task that requires three people. The following tools will be helpful: two yardsticks - a tape measure - string - a line level - paper - pencil.

- ◆ Tape the yardsticks together with a clear tape; you now have a six-foot survey rod.
- ◆ One person (Person #1) holds the yard sticks/survey rod and this person will move around the property.
- ◆ The second person (Person #2) has the beginning of a tape measure or string of a known length (minimum 25-ft. length).
- ◆ Person #1 with the rod holds the other end of the string/measure tape.
- ◆ Place the line level on the string or tape.
- ◆ Person #2 holds the string at eye level—the eye level height will be used as a benchmark for all other measurements. (Keep the string at eye level until measurements are complete.)
- ◆ Person #1 Moves the string up the rod until the line is level with Person #2. Then read the number off the rod, be sure to add the height on the second yardstick to that of the first. (Example: if the string is on 24 inches on the second yardstick, the number is actually 5 feet—3 feet on the first stick plus 2 feet on the second.)
- ◆ The third person (Person #3) will determine the line is level when the bubble on the line level is in the middle of the level. He or she will also be the recorder for the heights.
- ◆ Person #2 stays put while persons #1 and #3 move down the tape measure horizontally repeating the leveling procedure at each foot or 2-foot increment along the tape or string.
- ◆ Then start another survey line with person #2 still standing in the original spot and persons #1 and #3 moving in another direction from #2.



Person #1



Person #2



Person #3



After you have completed at least 4 transects or lines from the center (position of person #2), plot each transect on a sheet of graph paper with the length being the x axis and the elevation being the y axis. Refer to Figure 5. The line on the graph demonstrates to you the high and low spots across the bottom of the garden site. This will help determine the soil removal or additions to get a level ponding area.

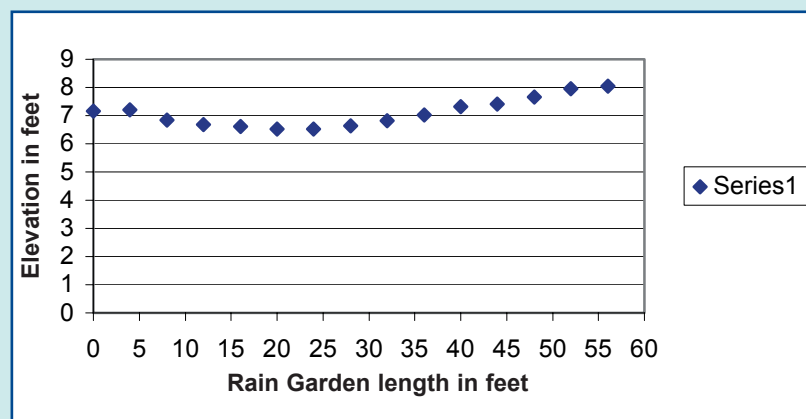


Figure 5. Graph of survey data

Your Soil

In Virginia, we have varying soils. We recommend contacting your local extension office for assistance with your decisions involving nutrients and pH. We will give you a simple process that can help you test your infiltration rate. You can test your drainage by digging a hole six inches wide and 18 inches deep. Pour water into the hole and observe how long it takes for the water to infiltrate into the soil. If the water has not infiltrated within 48-72 hours, then you will need to amend your soil to improve infiltration or choose another location for your Rain Garden.

What if my soil needs amending?

If your site does not have good infiltration, we recommend blending a mixture of amendments to improve the drainage. The recommended soil replacement mix is 50% sand, 25% topsoil (no clay) and 25% compost or leaf mulch. These supplies can be bought in bags from most home and garden stores or can also be purchased in bulk, depending on the size of your job. If you choose bagged amendments, avoid purchasing sterile soil.

Determine the Area of the Rain Garden

Depth

If you have checked your soil using the infiltration test and found that it has adequate infiltration and you do not need to amend your soil, then you may just need to excavate the area for the ponding depth of no more than six inches. You will not want your ponding depth to be greater than six inches because of the possibility that the ponded water could be retained longer than 96 hours. After 96 hours, the area would be prone to mosquitoes breeding, along with other undesirable insects.



If your infiltration test led you to amend your soil, then you will need to excavate the maximum six inches for ponding and three feet for ideal conditions. We recommend three feet of amendments to provide sufficient depth for plant root growth and for moisture capacity. You must also be able to determine where your water table is located. You do not want to go three feet, if this interacts with your water table. If you must locate your Rain Garden in the location that needs soil amendments, please count on the Rain Garden taking more time and money, so plan accordingly. If your location has extremely poor soil conditions, a layer of gravel or stone may be placed into the bottom of the Rain Garden to increase storage.

Width and Length

As you are planning your Rain Garden, visualize how the water will be directed to the garden and how it will be stored. You want to distribute the water evenly throughout the garden so that the entire garden gets equal amounts of flow. To help alleviate a potential excess ponding problem, you should place the Rain Garden length perpendicular to the flow of the runoff so that it can catch as much water as possible. You also want the Rain Garden to be wide enough to ensure sufficient room for plant variety and spacing and enough room for the water to be distributed over the bottom of the garden. A good rule of thumb is that the garden should be at least twice as long as it is wide.

When deciding your width and depth of the garden, keep the slope in mind. Rain Gardens that are on very steep slopes and extremely wide gardens will need to be dug much deeper on one side than the other in order to be level. Garden shapes can vary; the square footage is the most important feature to consider. Decide on the size garden that suits your site. We should state that the calculations are guidelines to include 100% of the runoff into the garden. If size or cost becomes an issue, it is acceptable to construct a smaller rain garden.

The size of the garden must be large enough to hold the water within the drainage area. The kind of surface the water is flowing over is important because that will determine how much will run off and how much infiltrates into the surface. For this reason, there is a runoff value that needs to be determined. Here are some examples of drainage area sizes and runoff values. For parking lots, roofs and other pavement the runoff value = 0.9; for turf it is 0.25. As stated by Prince George's County Design Manual For Use of Bioretention In Stormwater Management, the garden size should be 7% of the runoff surface area multiplied by the runoff value.